WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation and maintenance should be performed only by qualified personnel.

TM-110235U

VOLUME 2 -- SERVICE MANUAL

626-PA-6003

3-PHASE AC MONITOR

January 15, 1981
(Rev. 1 April 1982)
(Rev. 15 March 1983)
(Rev. 15 Jan. 1985)
(Rev. 15 May 1987)

See opposite side relative to proprietary rights.

NOTE: Refer to Volume 1 (Operator's Manual) of TM-110235U for operator's information.

PROPRIETARY INFORMATION
© COPYRIGHT 1981, 1982, 1983, 1985, 1987
BY DRANETZ TECHNOLOGIES, INC.
ALL RIGHTS RESERVED.

DRANETZ
DRANETZ TECHNOLOGIES, INCORPORATED
1000 New Durham Rd., PO Box 4019, Edison, NJ 08818-4019

NOTICE REGARDING DRANETZ' PROPRIETARY RIGHTS

This publication contains trade secrets and other information proprietary to Dranetz Technologies, Inc. By accepting and using this manual, the user agrees that:

1. The information contained herein will be used solely for the purpose of repairing or operating equipment of Dranetz Technologies, Inc.

2. This manual will be treated as containing proprietary information and access to the manual will be limited to only those in the company organization who are responsible for the maintenance of Dranetz equipment.

3. The manuals will be returned to Dranetz Technologies, Inc. when no longer required by the user, or when there is a change in ownership of the equipment.

These publications are protected by the Copyright laws of the United States Title 17 et seq. No part of this publication may be reproduced, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form, by any means, electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without the expressed written permission of Dranetz Technologies, Inc., 1000 New Durham Road, P.O. Box 4019 , Edison, New Jersey 08818-4019.

TABLE OF CONTENTS
626-PA-6003 3-PHASE AC MONITOR

Section			Page
IV		THEORY OF OPERATION.	4-1
	4.1	Scope	4-1
	4.2	General Functional Description.	4-1
	4.3	Analog Board A1, Detailed Description	4-2
	4.3.1	AC Input and Averaging Circuits	4-5
	4.3.2	Impulse Circuits.	4-5
	4.3.3	'System Check'.	4-6
	4.4	Digital Board A2, Detailed Description.	4-6
	4.4.1	Busses and Address Decoding	4-6
	4.4.2	Input Period Measurements	4-6
	4.4.3	Analog-to-Digital Conversion.	4-7
	4.4.4	Impulse Duration Counters	4-8
V		MAINTENANCE AND CALIBRATION	5-1
	5.1	Scope	5-1
	5.2	Special Test Equipment Required	5-1
	5.3	Additional Test Equipment Required.	5-1
	5.4	Servicing Cautions and Warnings	5-1
	5.5	626-PA-6001 Calibration	5-2
	5.5.1	Preliminary Setup	5-2
	5.5.2	Calibration Procedure	5-4
VI		REPLACEABLE PARTS LIST.	6-1
	6.1	General	6-1
	6.2	Manufacturers Code Numbers.	6-1
VII		SCHEMATIC DIAGRAMS AND ASSEMBLY DRAWINGS.	7-1

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

LIST OF ILLUSTRATIONS

Figure		Page
4-1	6003 Analog Board, Block Diagram.	4-3
4-2	6003 Digital Board, Block Diagram	4-4
5-1	Analog Board A1, Location of Switches	5-3
7-1	6003 Analog Board, Assembly Drawing 110244. . . .	7-3
7-2	6003 Digital Board, Assembly Drawing 110236 . . .	7-5
7-3	6003 Analog Board, Schematic Diagram (Assy 110244, Schematic 110249)	7-7
7-4	6003 Digital Board, Schematic Diagram (Assy 110236, Schematic 110241)	7-9

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

STATEMENT OF WARRANTY

ALL PRODUCTS OF DRANETZ TECHNOLOGIES, INC. ARE WARRANTED TO THE ORIGINAL PURCHASER AGAINST DEFECTIVE MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY. DRANETZ WILL REPAIR OR REPLACE, AT ITS OPTION, ALL DEFECTIVE EQUIPMENT RETURNED, FREIGHT PREPAID, DURING THE WARRANTY PERIOD, WITHOUT CHARGE FOR REPAIR, PROVIDED THERE IS NO EVIDENCE THAT THE EQUIPMENT HAS BEEN MISHANDLED OR ABUSED. THIS WARRANTY SHALL NOT APPLY TO ANY DEFECTS RESULTING FROM IMPROPER OR INADEQUATE MAINTENANCE, BUYER-SUPPLIED HARDWARE/SOFTWARE OR INTERFACING, UNAUTHORIZED MODIFICATION OR MISUSE OF THE EQUIPMENT, OPERATION OUTSIDE OF THE ENVIRONMENTAL SPECIFICATIONS FOR THE PRODUCT, OR IMPROPER SITE PREPARATION OR MAINTENANCE.

The information in this manual has been reviewed and is believed to be entirely reliable. No responsibility, however, is assumed for any inaccuracies. The material in this manual is for information purposes only, and is subject to change without notice.

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_10356

VOLUME 2
SERVICE MANUAL

626-PA-6003 3-PHASE AC MONITOR

SECTION IV
THEORY OF OPERATION

4.1 SCOPE

Volume 2 of TM-110235U provides the service, calibration, and maintenance instructions for the 6003 3-Phase AC Monitor, hereinafter referred to as the 6003 plug-in. This manual is divided into four sections: (IV) THEORY OF OPERATION, (V) MAINTENANCE AND CALIBRATION, (VI) REPLACEABLE PARTS LIST, and (VII) SCHEMATICS AND ASSEMBLY DRAWINGS. See Volume 1 of TM-106705U (contained in Sections I through III) for the installation and operation instructions.

4.2 GENERAL FUNCTIONAL DESCRIPTION

The 6003 plug-in is equipped with its own on-board microprocessor. Therefore the main CPU in the 626 mainframe is not burdened with performing cycle-by-cycle measurements and comparing readings to programmed limits. To differentiate between the mainframe microprocessor and the on-board microprocessor in the following discussion, the mainframe chip will be referred to as the 6502; the on-board chip, as the 6805.

As soon as power is applied to or restored to the mainframe, the 6003 plug-in begins to measure voltage and looks for impulses at each of its three phase inputs. This initial scanning is performed at a 60 Hz rate and takes place whether or not any AC input is present. If the phase A AC input is present at peak amplitude of at least 50 volts, input scanning is adjusted to follow that of the phase A input. In any case, no event printout can occur until the 6805 (on-board processor) receives from the 6502 a full set of parameters that define the various input conditions which may constitute a "disturbance". Once the 6805 is so programmed, it continues to take regular measurements of its inputs and does not disturb the 6502 unless a disturbance is detected.

The 6502 has no direct control over any of the circuits used for voltage, impulse or frequency measurement. Similarly, the 6805 has no access to the memory space in the 6502. All inter-processor communication is accomplished through two ports in combination with a handshake line, facilitating a simple reliable asynchronous parallel interface.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

During normal operation in the OPERATE mode, the 6805 takes cycle-by-cycle measurements in all three phases for AC level and impulse peak, polarity and duration. AC readings are compared to previously established limits for detection of out-of-limits or return-to-normal events. (The 6805 does not differentiate between SAG/SURGE and UNDER/OVERVOLTAGE events.) While out of limits, the most extreme voltage measured is recorded. A test for increasing or decreasing voltage is performed. If an impulse peak has equalled or exceede the programmmed sensitivity, this peak value is saved along with its polarity and duration. A change in frequency may also be recorded if it equals or exceeds programmed sensitivity.

If, after all measurement analysis is completed, one or more disturbances have been detected, the 6805 requests service from the 6502. Acknowledgement of the request results in a data transfer after which the 6805 waits until it is time to make more measurements or perform some other task for the 6502 (such as providing present voltage and frequency, running a system check sequence, or accepting a new set of user-programmed parameters.) If the 6502 fails to respond by the end of the cycle, the 6805 gives up and resumes cycle-by-cycle operation.

It should be noted that the voltage/impulse measurement cycle is not phase-locked to the input line frequency. If the phase A input should drop out, scanning of the inputs continues unaffected. When input to phase A is restored, scanning frequency may or may not be adjusted; if it is, a frequency change event may be detected, otherwise no change in frequency is recorded.

The 6003 circuits are packaged on two PC boards: Analog board A1 and Digital board A2. AC line inputs are connected to the analog board which contains input amplifiers, AC averaging and impulse peak detecting circudits, an analog multiplexer and a system check signal generator. (See figure 4-1.) The digital board contains the 6805 microprocessor, two 4K-byte EPROMS (one for the 6805 and one used by the 6502, containing routines peculiar to the 6003), 6502/6805 interface circuits, an analog-to-digital converter and counters for frequency and impulse duration measurement. (See figure 4-2.) The two boards are connected by a flat ribbon cable through which run power, grounds, and various analog and control signals.

4.3 ANALOG BOARD A1, DETAILED DESCRIPTION (See figure 7-3.)

NOTE

Since most of this board consists of three identical sections (one per AC phase), the following description is keyed to phase A, but applies equally to the phase B and phase C circuits except where noted.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987 Dranetz Technologies, Inc. All Rights Reserved.

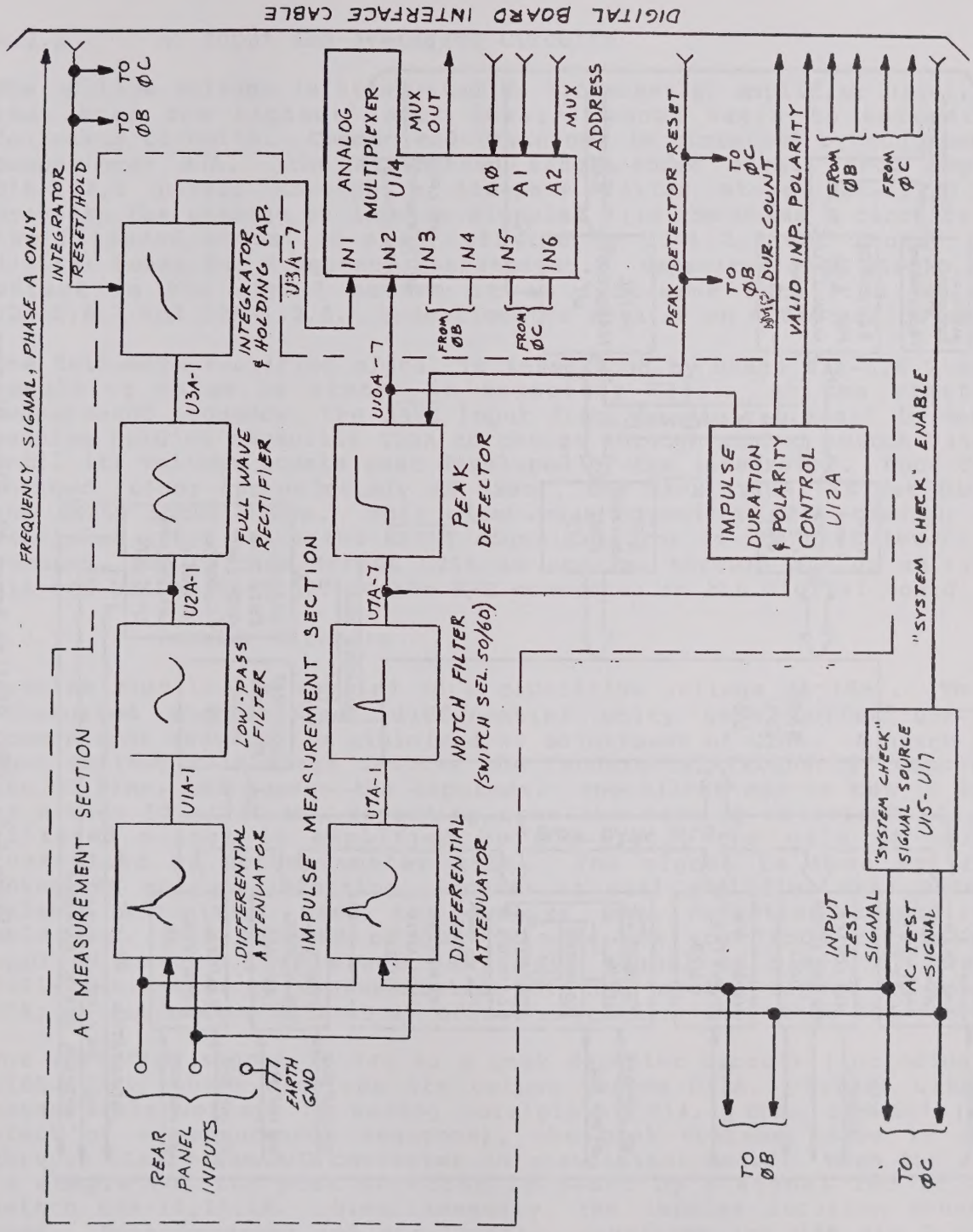


Figure 4-1. 6003 Analog Board A1, Block Diagram

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

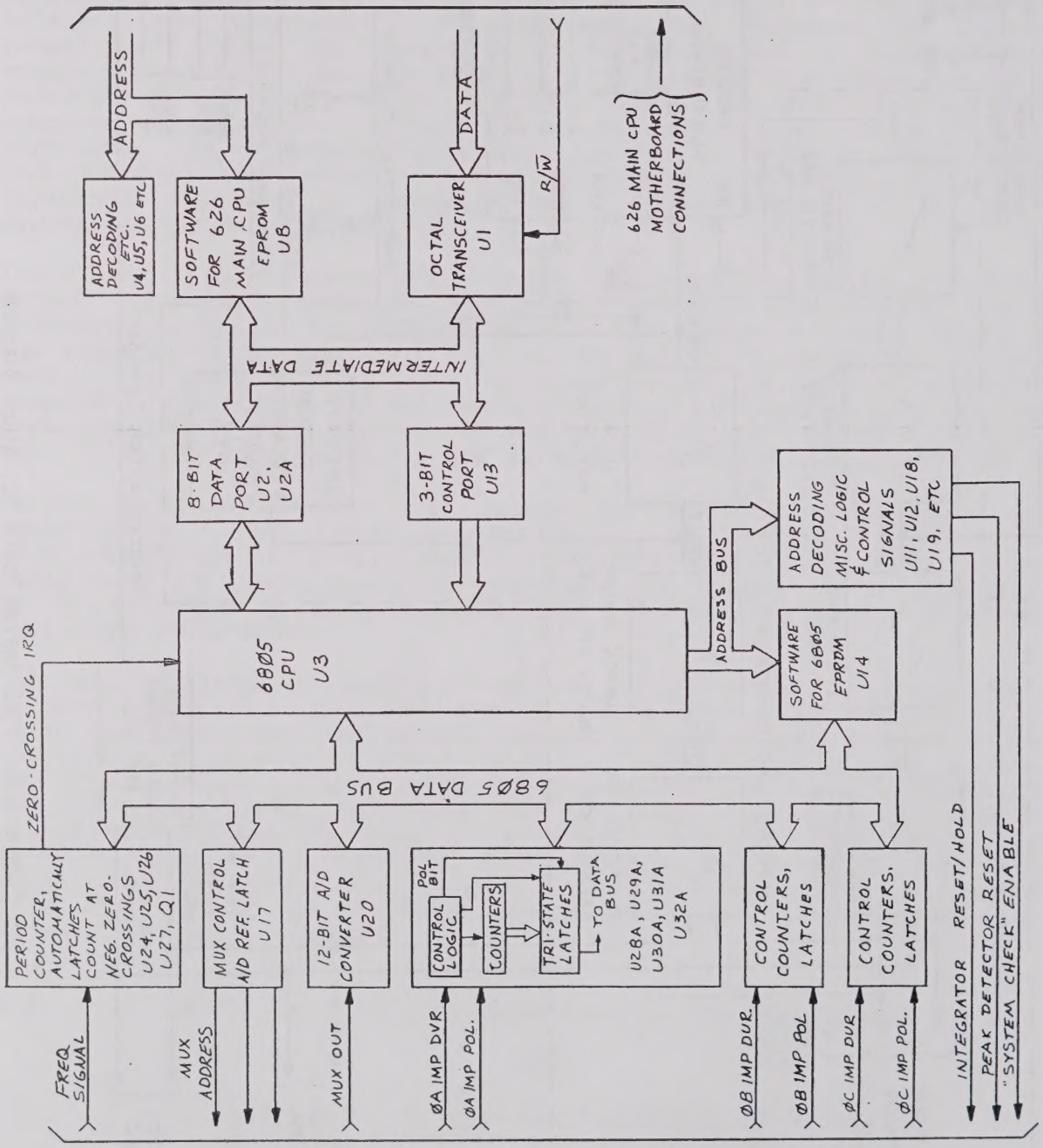


Figure 4-2. 6003 Digital Board A2, Block Diagram

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

4.3.1 AC Input and Averaging Circuits

The AC line voltage is attenuated by differential amplifier U1A-1,2,3 so that even the highest input levels cannot begin to saturate the following circuits. Common mode response is minimized by adjustment of potentiomer R7A. The attenuated single-ended signal from amplifier U1A-1,2,3 passes through a low-pass filter stage U2A-1,2,3 which prevents the passage of impulse signals. (In the phase A circuits only, the filtered signal is also buffered by U6-1,2,3 and routed to the digital board for frequency measurement.) Capacitor C22A blocks any DC offset in the signal before it is full-wave rectified by stages U2A-5,6,7 and U3A-1,2,3. Potentiometer R84A is an offset adjustment.

The full-wave rectified signal is integrated by stage U3A-5,6,7 and the resulting value is stored in capacitor C24A. At the start of a measurement sequence, the SAVE input from the digital board is set low, causing holding capacitor C25A to charge through analog switch U4A-6,7,8 until its voltage equals that developed by the integrator. Once C25A is charged (after approximately 10 uSec), the SAVE signal is set high and the RESET input drops. This discharges capacitor C24A through switch U4A-1,2,3 after which the RESET signal returns to its high level. Upon command, the voltage across C25A is applied through analog multiplexer U14 and buffer U6-5,6,7 to the A/D converter in the digital board.

4.3.2 Impulse Circuits

Impulse signals are applied to a capacitive voltage digider. The dual attenuated signals feed differential unity gain buffer U7A-1,2,3. Common mode response is minimized by adjustment of C10A. A notch filter that follows this stage removes the fundamental frequency component of the AC line, but passes the impulses. The filter may be set to operate at either 50 or 60 Hz, depending upon the setting of switch S1A. The filtered signal is amplified by U7A-5,6,7, the gain of which is controlled by potentiometer R81A. The signal is then split into inverting and non-inverting circuits at dual amplifier U8A; R40A is a balance adjustment used to equalize peak detection regardless of polarity. The outputs of dual stages U8A are diode rectified and applied to pin 3 of stage U9A. The signal at pin 1 of U9A is a full-wave rectified representation of the impulse signal at pin 1 of U7A; potentiometer R33A is an offset adjustment for stage U9A-5,6,7.

The rectified signal is fed to a peak detector circuit (including stage U10A-1,2,3) which develops its output across C41A. Buffer U10A-5,6,7 passes this voltage to analog multiplexer U14. Upon command (at the start of a measurement sequence), the peak voltage value is applied through U14 to the A/D converter in the digital board. When the reading is completed, the peak detector is reset by a signal fed to analog switch U4A-14,15,16. Simultaneously, the impulse duration counter is read. Both inverted and non-inverted waveforms (at U8A pin 7 and U8A pin 1, respectively), along with the buffered peak detector output (at U10A pin 7) are applied to the inputs of four comparators (quad U12A) the outputs of which control the impulse duration counters on the digital board.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

4.3.3 'System Check'

A 'system test' sequence is initiated when the $\overline{\text{CAL START}}$ signal is momentarily set low by the local processor in the digital board. (This occurs when the local processor receives a calibration command from the mainframe processor.) The low level triggers one-shot U15-1,4, closing analog switches U18, U19, and U20 for an interval determined by network C30 and R54. With the analog switches momentarily activated, the inputs to the AC sections of the three phases in the analog board are removed by grounding points JA, MA (phase A), JB, MB (phase B) and JC, MC (Phase C). In addition, the momentarily low level at pin 4 of one-shot U15 enables oscillator U16 which directs the square wave output through buffer U17(1,2,3) and the three analog switches to test inputs BA, BB, and BC (at the inputs of amplifiers U1A, U1B, and U1C). The oscillator operates at 50 or 60 Hz, depending on the positions of switches S2 and S3.

When the $\overline{\text{CAL START}}$ line is set low, transistor switch Q1 is turned on, discharging C32. When the $\overline{\text{CAL START}}$ is reset to its normally high level, C32 starts to charge. When its charge reaches 2.5 volts, it triggers one-shot U15-9,12. As a result, three other sections of analog switches U18, U19, and U20 close momentarily, injecting an impulse into points DA, DB and DC at the inputs of the impulse circuit in each phase. The level of the impulse test signal is adjusted by potentiometer R50.

4.4 DIGITAL BOARD A2, DETAILED DESCRIPTION (SEE FIGURE 7-4)

4.4.1 Busses and Address Decoding

The 6805 microprocessor U3 is not implemented with separate data and address busses. Instead, the address bus is created by using octal latch U11 to store valid addresses on the falling edge of the address strobe signal that appears at pin 6 of U3. Every chip connected to the data bus is gated so that no bus contention occurs during the set-up of addresses. The 4K-byte EPROM U14 used by U3 occupies half of its addressing range and is selected when AB12 is set high.

Twelve addresses are used by U3 to access all necessary hardware. Selection of one of these addresses by U3 causes one of 12 outputs on either decoder U6 or U12 to go low, enabling the appropriate circuits. Refer to Table 4-1.

4.4.2 Input Period Measurements

The low-pass filtered phase A signal from the analog board is applied to operational amplifier U27 (1,2,3) where it is converted to a square wave. The sharp rising edge of the waveform causes the period count to be latched by U24 and U25, and turns on Q1 which triggers 1-shot U18. The 1-shot resets the period counter, generating an interrupt request to U3. The interrupt signal is latched at U9-4; it is not cleared until U3 reads the input period.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

Table 4-1. Address Functions

Decoder Pin No.	Software Function	Hardware Function
U6-12	Set up for A/D Converter	A/D, Ref, & Mux Control Latch
U6-11	Start or Read A/D Converter	Start or Read A/D Converter
U6-10	Reset AC Hardware Integrators	Save Volts, Reset
U6-9	Start 'Cal' Hardware Signal	Inject AC & Impulse Test
U12-15	Read Impulse During Phase A	
U12-14	Read Impulse During Phase A	Reset Peak Detector Phase A
U12-13	Read Impulse During Phase B	
U12-12	Read Impulse During Phase B	Reset Peak Detector Phase B
U12-11	Read Impulse During Phase C	
U12-10	Read Impulse During Phase C	Reset Peak Detector Phase C
U12-9	Read Input Period	Clear Interrupt Request
U12-7	Read Input Period	Clear Interrupt Request

4.4.3 Analog-to-Digital Conversion

To perform a voltage measurement, U3 writes a byte to control latch U17. This operation results in three actions: (1) the desired voltage is sent through the analog multiplexer, (2) prepares the A/D converter for a conversion, and (3) selects the appropriate reference voltage against which the measurement is to be made.

The A/D converter (U20) uses either of two reference voltages. One reference is a fixed voltage (calibrated with potentiometer R14) that is used for measurement of impulse peaks. The second reference is used for AC level; its amplitude depends on the phase A input frequency. To obtain this value, the voltage across zener diode CR5 is integrated for the duration of the measurement period as determined by U3. Potentiometer R15 adjusts the integrator output for optimum results. At the end of a measurement cycle, the voltage at pin 7 of U27 is stored in C16 and the integrator is reset. The buffered voltage at C16 becomes the AC reference.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

When an A/D conversion is complete, U3 writes another byte to the control latch, preparing the converter for output of data. Simultaneously, the A/D input is grounded, enabling it to settle at a known level.

4.4.4 Impulse Duration Counters

There are four comparators per phase used in the analog board. Any positive impulse greater than approximately 25 volts peak causes one of the comparator outputs to go low, generating a START COUNT signal for as long as impulse amplitude remains above 25 volts. Another comparator output is set low, generating a POL POS signal, when a positive impulse has a peak amplitude greater than any other impulse peak that has occurred during the same cycle. START COUNT and POL NEG signals are also generated for negative impulses, so that there are four signals for each of the three phases. These signals are all routed through the ribbon cable to the digital board.

A set of counters and latches (U28-U32) are included on the digital board for each of the three phases. As long as both START COUNT signals are high, the counters are in a reset condition (all zeros). As long as either START COUNT is low, the counters are active. Microprocessor U3 does not read the counters directly; instead, it reads the outputs of tri-state latches U30 and U32. At the beginning of a measurement cycle, as the impulse peak detectors on the analog board are reset, the counters are also reset. At this time, the zero outputs of the counters are latched. In order for a duration count to be latched, the amplitude of an impulse must first be large enough to generate the low level START COUNT signal. The latch inputs are enabled only if either the POL POS or POL NEG signal goes low. When this occurs, a polarity bit is latched (logic 1 for positive and logic 0 for negative polarity), and the latches follow the counter outputs. As the impulse level falls below 25 volts, the latches are secured and the counters are reset. In other words, the durations of most impulses are counted but only the duration of the largest impulse within a cycle is latched so that microprocessor U3 can read it.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

SECTION V
MAINTENANCE AND CALIBRATION

5.1 SCOPE

This section contains procedures and data that will help ensure continuity of service of the 6003 plug-in. Test and calibration procedures are provided for all major plug-in functions. Items of special test equipment designed for field service testing of the plug-in are described and step-by-step instructions are presented for their use. Refer to the General Precautions in Volume 2 of the Series 626 Mainframe Manual.

5.2 SPECIAL TEST EQUIPMENT REQUIRED

1) Series 626 Universal Disturbance Analyzer. Mainframe to house 6003 plug-in.

2) Model 604A Disturbance Simulator. The Model 604A simulates a variety of disturbances to verify plug-in performance. In combination with other test equipment, it is used for calibration.

3) Extender Card (Dranetz P/N 110260). This card permits plug-in cards to be operated outside the card rack, facilitating calibration and troubleshooting.

5.3 ADDITIONAL TEST EQUIPMENT REQUIRED

Table 5-1 lists additional items of test equipment recommended for maintenance of the 6003 plug-in. Substitution of equivalent equipment may be made.

5.4 SERVICING CAUTIONS AND WARNINGS

WARNING

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

READ INSTRUCTIONS CAREFULLY

Because of potential shock or fire hazards, do not perform any task for which you are not qualified. At the time of this writing, Underwriters Laboratories, Inc. has determined a qualified person to be self determined by that person who attempts to perform the specific task.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987 Dranetz Technologies, Inc. All Rights Reserved.

Table 5-1. Additional Test Equipment Required

Item	Characteristics	Model
Dual Trace Oscilloscope	Bandwidth: DC: 0 Hz to 10 MHz AC: 3 Hz to 10 MHz Accuracy: ±3%	Tektronix 434 Phillips 3233
AC Voltmeter	Bandwidth: 45 Hz to 10 kHz Accuracy: ±0.5%	Fluke 8800A
AC Source	Sinewave Voltage, 0 to 300V or more Stability ±0.1V Frequency: 45.0 to 65.0 Hz Stability 0.1 Hz Floating output	Optimation AC650, or Wavetek 162 with McIntosh 2100 Amplifier

5.5 626-PA-6003 CALIBRATION

5.5.1 Preliminary Setup

1) Remove the four screws securing the Digital Board (with the gold fingers) to the rest of the plug-in assembly.

2) Install an extender card (P/N 110260) in one of the input slots of the 626 mainframe and insert the Digital Board into the end of the extender card, so that the Analog Board lies on the bench with the component side up and the rear panel away from the 626.

3) Using an alligator-to-alligator lead constructed with No. 18 AWG stranded wire, connect the 626 chassis to one of the metal brackets attached to the rear panel of the 6003 plug-in.

4) Referring to figure 5-1, set switches S1 (A, B, C), S2 and S3 for the desired nominal frequency.

5) Apply power to the 626, put the unit in the PROGRAM mode, select the appropriate channel, and depress PRESET. Leave the unit in the PROGRAM mode during common mode adjustments.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

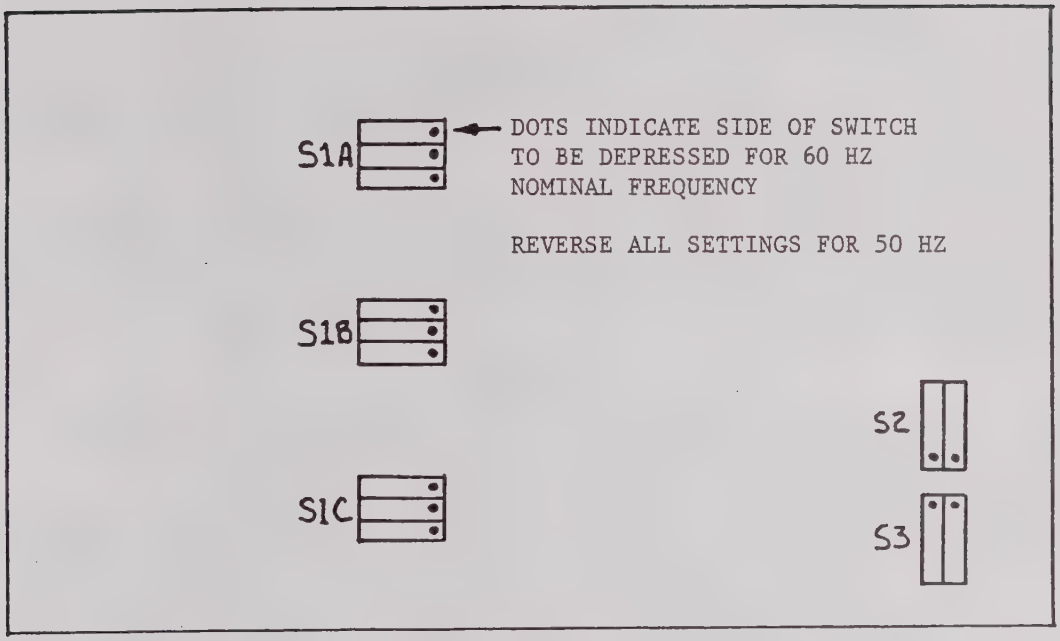


Figure 5-1. Analog Board A1, Location of Switches

GENERAL NOTES

Since the Analog Board contains three almost identical sections, corresponding components will usually be referred to collectively. For example, "adjust R7 (A,B,C)" will mean the same as "adjust R7A, R7B, and R7C". Unless otherwise noted, all adjustments are made on the Analog Board.

Since there are no separate test points on either PC board, care must be taken when referencing oscilloscope probes to signal grounds since it is easy to inadvertently short out and subsequently destroy one of the mainframe power supply outputs. The negative side of C34 is often used for analog ground and the microprocessor crystal case may be used for digital ground.

A CRT terminal connected to the 626 RS-232 output will allow the thermal printer to be turned off, making readings a lot faster.

AC frequency used during calibration should correspond with the switch settings as mentioned above.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

5.5.2 Calibration Procedure

AC Common Mode

1) Short together all "+" and "-" plug-in inputs so that all three phases are connected.

2) Apply 120V RMS between the shorted inputs and 626 chassis ground. Adjust R7(A,B,C) for minimum signal (no more that 10 mV p-p) at U1 (A,B,C), pin 1. C1 (A,B,C) may need to be selected to achieve acceptable results.

AC Level

1) Connect all "+" inputs together and connect all "-" inputs together so all three phases are in parallel.

2) Put the 626 in the OPERATE mode for SUMMARY ONLY printing.

3) Set R38 (A,B,C) to the center of rotation.

4) Apply between 300 and 500 volts to the inputs.

5) Use the data summary as a meter to read voltage on all phases. Adjust R15 on the Digital Board so that one phase reads close to the input voltage, one above, and the third below. Adjust R38 (A,B,C) so that all phases agree with the input voltage. This completes AC level calibration for Revision A boards.

6) Decrease input voltage to 50 volts. Adjust R84 (A,B,C) so that all three phases read close to 50 volts.

7) Repeat steps 4, 5, and 6 until all phases read correctly to within $\pm$0.6 volts at both voltages.

Impulse Common Mode

1) Short together all "+" and "-" plug-in inputs so that all three phases are connected.

2) Leave the 626 in the PROGRAM mode.

3) Connect the 604A Disturbance Simulator so that the black wire labelled "A1" is in contact with the 626 chassis ground and the red lead marked "A2" is connected to the shorted inputs of the plug-in.

4) Set the 604A to "IMPULSE CAL" with phase A selected.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

5) Using an oscilloscope, set the 604A IMPULSE control for 500 volt peak impulses. The pulse shape should be a half-sinewave of about 10 microseconds duration. Leave the scope set to trigger on the rising edge of the 604A impulse output.

6) While generating impulses, adjust C10 (A,B,C) for minimum signal (not more than 20 mV) at U7 (A,B,C) pin 1.

Impulse Offset

1) Remove all voltages from the "+" and "-" plug-in inputs and connect all inputs to the 626 chassis ground.

2) Leave the 626 in the PROGRAM mode.

3) Set up the oscilloscope to trigger from the rising edge of the 5-volt logic signal on pin 28 of the A/D converter, U20 on the Digital Board. With the time base set for 0.2 mSec/div, there should be six positive pulses about 20 uSec wide, spaced about 1 division apart. This "STATUS" signal is high while a conversion is in progress. The analog signal at pin 13 is the input to the A/D converter. Voltage levels at pin 13 during A/D conversions represent AC and impulse measurements. The first three conversions are for AC levels on phases A, B, and C, respectively; the remaining three measurements are for impulse peaks for the same order of phases.

4) With the other channel of the scope set for 100 mV/div., observe the voltage level at pin 13 of the A/D converter. Adjust R33 (A,B,C) so that all three impulse levels are at ground level.

Positive Impulse Amplitude

1) Connect all "+" inputs together and connect all "-" inputs together so all three phases are in parallel.

2) Program the impulse threshold to 100 volts and put the 626 in the OPERATE mode for NORMAL printout.

3) Set R81 (A,B,C) to the center of rotation.

4) Connect the black wire of the 604A labelled "A" to the "-" inputs and the red lead marked "A2" to the "+" inputs.

5) Set the 604A output as for steps 4 and 5 of the common mode adjustment.

6) While generating pulses, adjust R14 on the Digital Board so that one phase reads 525 volts, one reads above this, and the third below. Adjust R81 (A,B,C) until all three phases read +525 volts.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

Negative Impulse Amplitude

1) Reverse the polarity at the inputs by exchanging the 604A "A1" and "A2" connections.

2) While generating impulses, adjust R40 (A,B,C) so that all phases read -525 volts.

System Check Generator

1) Remove all voltages from the inputs.

2) With the 626 in the "OPERATE" mode, move the PRINTOUT MODE switch to the "SYSTEM CHECK" position. This should cause repeated printouts to occur.

3) Adjust R46 until phase B indicates an AC reading as close as possible to 200.0 volts. Adjust R34 and R35 (if present) so that phases A and C read as close as possible to 200.0 volts.

4) Adjust R50 so that impulse readings are all as close as possible to 3000 volts. Polarity should be negative and duration should be about 400 uSec (this may change for later revisions). There is no adjustment for impulse duration.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

SECTION VI

REPLACEABLE PARTS LIST

6.1 GENERAL

The replaceable parts list identifies all maintenance parts in the 6003 plug-in. For each part, the reference designation (if applicable) is shown, along with part number, the manufacturer's code number and description. Figures 7-1 and 7-2 locate the parts on Analog Board A1 and Digital Board A2, respectively.

6.2 MANUFACTURER'S CODE NUMBERS

The manufacturers code numbers are identified below.

00779	Amp. Inc., P.O. Box 3608 Harrisburg, PA 17105
23207	Dranetz Technologies, Inc. 1000 New Durham Road, P.O. Box 4019 Edison, N.J. 08818-4019
81349	On MIL Spec list. Manufactured to meet military standards. Available from a variety of suppliers.

REPLACEABLE PARTS LIST

626-PA-6003 - MAIN ASSEMBLY 110235-G( )

REF DESIGNATION	PART NO.	MAN CODE NO.	DESCRIPTION
	103253-G7*	23207	Terminal Block
	110278*	23207	Rear Input Terminal Cover
J1-J3	110738-G1**	23207	Connector Housing (3)
	350690-1**	00779	Pin Contacts (9)
	110480-G1** or -G2**	23207	626 AC Module Cable Assy
	110242	23297	Interface Cable Assy
A1	110244	23207	Analog Board
A2	110236	23207	Digital Board

*Used only on 110235-G1.
**Used only on 110235-G2.

Proprietary Information - Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

REPLACEABLE PARTS LIST

626-PA-6003

ANALOG BOARD A1 (P/N 110244)

REFERENCE DESIGNATION	PART NO.	MAN. CODE NO.	DESCRIPTION
C1A,B,C C2A,B,C	Sel @ Test	23207	Cap, 82-120 pf (nom 100 pf P/N 104D10-G7)
C4A,C4B C4B,C5B C4C,C5C	104115	23207	Cap, 50 pf, 3KV (matched pair)
C6A,B,C C16A,B,C C18A,B,C C19A,B,C C51A,B,C	104110-G6	23207	Cap, .015 uf, 2%, 50V
C7A,B,C C41A,B,C	104110-G5	23207	Cap, .01 uf, 2%, 50V
C8A,C9A C8B,C9B C8C,C9C	104122	23207	Cap, .033 uf, 50V (matched pair)
C10A,B,C	104109-G3	23207	Cap, Var, 6.5-30 pf, 100V
C11A,B,C C12A,B,C C14A,B,C C15A,B,C	104111-G3	23207	Cap, 75 pf, 2%, 500V
C13A,B,C	104027-G1	23207	Cap, 50 pf, 5%, 500V
C17A,B,C	104020-G6	23207	Cap, 750 pf, 2%, 300V
C20A,B,C C21A,B,C	104018-G2	23207	Cap, 47 pf, 5%, 500V
C22A,B,C C38	104067-G6	23207	Cap, 22 uf, 10%, 6V

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

REPLACEABLE PARTS LIST

626-PA-6003

ANALOG BOARD A1 (P/N 110244) (CONT'D)

REFERENCE DESIGNATION	PART NO.	MAN. CODE NO.	DESCRIPTION
C24A,B,C	104110-G1	23207	Cap, .022 uf, 2%, 50V
C25A,B,C	104066-G2	23207	Cap, 5600 pf, 5%, 300V
C27	104067-G5	23207	Cap, 10 uf, 5%, 6V
C29,C33,C35, C37,C42A,C42B, C42C	103209-G2	23207	Cap, 0.22 uf, 20%, 50V
C30	104067-G4	23207	Cap, 15 uf, 10%, 16V
C31	104039-G9	23207	Cap, .01 uf, 10%, 100V
C32, C44A,B,C C45A,B,C C46A,B,C C47-C49, C50A,B,C C52A,B,C C53A,B,C C54A,B,C C59-C62	103209-G3	23207	Cap, 0.47 uf, 20%, 50V
C34,C36	104067-G7	23207	Cap, 33 pf, 10%, 16V
C40A,B,C	104021-G1	23207	Cap, 1000 pf, 5%, 100V
C55A,B,C C56A,B,C C57A,B,C C58A,B,C	104017-G5	23207	Cap, 36 pf, 5%, 500V
CR2A,B,C CR3A,B,C CR10	104412-G2	23207	Diode, Hi Speed Switching

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

REPLACEABLE PARTS LIST

626-PA-6003

ANALOG BOARD A1 (P/N 110244) (CONT'D)

REFERENCE DESIGNATION	PART NO.	MAN. CODE NO.	DESCRIPTION
CR4A,B,C CR5A,B,C	102899	23207	Diode, Hot Carrier
CR8	103295	23207	Diode, Zener (1N825A)
J10	1-102160-1	00779	Rt Angle Pin Header
L1A,B,C L2A,B,C	104620	23207	Inductor, 0.1 MHz
Q1	104506	23207	Transistor
R1A,B,C R5A,B,C	104711	23207	Resistor Network
R2A,B,C R4A,B,C	RN55C3653F	81349	Res, 365K, 1%, 1/10W
R3A,C	RN55C6813F	81349	Res, 681K, 1%, 1/10W
R3B	RN55C6983F	81349	Res, 698K, 1%, 1/10W
R6A,B,C R8A,B,C R9A,B,C R36A,B,C R48	RN55C1002F	81349	Res, 10K, 1%, 1/10W
R7A,B,C R33A,B,C	104719-G4	23207	Res, Var, 20K, 10%, 1/2W
R10A,B,C R11A,B,C	RN55C1003F	81349	Res, 100K, 1%, 1/10W
R13A,B,C R16A,B,C	RN55C2553F	81349	Res, 255K, 1%, 1/10W

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

REPLACEABLE PARTS LIST

626-PA-6003

ANALOG BOARD A1 (P/N 110244) (CONT'D)

REFERENCE DESIGNATION	PART NO.	MAN. CODE NO.	DESCRIPTION
R14A,B,C R15A,B,C R18A,B,C R19A,B,C 82A,B,C R83B,C R85	RN55D3164F	81349	Res, 3.16 Meg, 1%, 1/10W
R21A,B,C R27A,B,C	RN55D1004F	81349	Res, 1 Meg, 1%, 1/10W
R22A,B,C R23A,B,C R61	RCRO7G622J	81349	Res, 6.2K, 5%, 1/4W
R24A,B,C R31A,B,C, R32A,B,C R35A,B,C R37A,B,C	RN55C2002F	81349	Res, 20K, 1%, 1/10W
R25A,B,C R28A,B,C R29A,B,C R30A,B,C R66A,B,C R68A,B,C R69A,B,C R70A,B,C	RN55C3011F	81349	Res, 3.01K, 1%, 1/10W
R26A,B,C R67A,B,C	RN55C4752F	81349	Res, 47.5K, 1%, 1/10W
R34A,B,C R64A,B,C	RN55C1000F	81349	Res, 100 ohms, 1%, 1/10W
R38A,B,C	104719-G5	23207	Res, Var, 50K, 10%, 1/2W
R39A,B,C	RN55C4873F	81349	Res, 487K, 1%, 1/10W

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

REPLACEABLE PARTS LIST

626-PA-6003

ANALOG BOARD A1 (P/N 110244) (CONT'D)

REFERENCE DESIGNATION	PART NO.	MAN. CODE NO.	DESCRIPTION
R40A,B,C R81A,B,C	104719-G6	23207	Res, Var, 1K, 10%, 1/2W
R41A,B,C	RN55C7501F	81349	Res, 7.5K, 1%, 1/10W
R42A,B,C R65A,B,C	RN55C2001F	81349	Res, 2K, 1%, 1/10W
R46	104719-G2	23207	Res, Var, 5K, 10%, 1/2W
R47,R55-R57	RCRO7G104J	81349	Res, 100K, 5%, 1/4W
R49	RN55C1542F	81349	Res, 15.4K, 1%, 1/10W
R50	104719-G3	23207	Res, Var, 10K, 10%, 1/2W
R51	RCRO7G155J	81349	Res, 1.5 Meg, 5%, 1/4W
R53,R79	RCRO7G102J	81349	Res, 1K, 5%, 1/4W
R54	RCRO7G154J	81349	Res, 150K, 5%, 1/4W
R58	RN55C1541F	81349	Res, 1.54K, 1%, 1/10W
R60	RCRO7G512J	81349	Res, 5.1K, 5%, 1/4W
R62A,B,C	RN55C1001F	81349	Res, 1K, 1%, 1/10W
R63A,B,C	RN55C2551F	81349	Res, 2.55K, 1%, 1/10W
R71A,B,C R72A,B,C	RN55C4323F	81349	Res, 432K, 1%, 1/10W
R73A,B,C R75A,B,C	RN55D1474F	81349	Res, 1.4 Meg, 1%, 1/10W
R74A,B,C R76A,B,C	RN55C3013F	81349	Res, 301K, 1%, 1/10W
R77A,B,C	RN55C7502F	81349	Res, 75K, 1%, 1/10W

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

REPLACEABLE PARTS LIST

626-PA-6003

ANALOG BOARD A1 (P/N 110244) (CONT'D)

REFERENCE DESIGNATION	PART NO.	MAN. CODE NO.	DESCRIPTION
R78A,B,C	RN55C3743F	81349	Res, 374K, 1%, 1/10W
R80	RCR07G304J	81349	Res, 300K, 5%, 1/4W
R83A,B,C	RN55D1005F	81349	Res, 10 Meg, 1%, 1/10W
R84A,B,C	104719-G7	23207	Res, Var, 100K, 10%, 1/2W
R86,R87	104719-G5	23207	Res, Var, 50K, 10%, 1/2W
S1A,B,C	104847-G1	23207	Switch, Dual In-Line, Rocker
S2,S3	104832	23207	Switch, Dual In-Line Rocker
U1A,B,C U2A,B,C U3A,B,C U6,U17	104236-G2	23207	IC, Dual Op Amp
U4A,B,C U18-U20	104255-G1	23207	IC, Quad Switch
U7A,B,C U8A,B,C U9A,B,C U10A,B,C	104247-G1	23207	IC, Op Amp, Hhi Slew Rate
U12A,B,C	104241-G2	23207	IC, Quad Comparator
U14	104242-G1	23207	IC, 1 of 8 Analog Mux
U15	104216-G6	23207	IC, Dual Multivibrator
U16	104203-G4	23207	IC, Binary Counter
U21A,B,C	104340	23207	IC, Diode Array
Y1	104939	23207	Crystal, 12.8 KHz
Y2	107519	23207	Crystal, 30.72 Hz

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

REPLACEABLE PARTS LIST

626-PA-6003

DIGITAL BOARD A2 (P/N 110236)

REFERENCE DESIGNATION	PART NO.	MAN. CODE NO.	DESCRIPTION
C1	104067-G3	23207	Cap, 56 uf, 10%, 6V
C2,C3	104067-G4	23207	Cap, 15 uf, 10%, 16V
C4-C6,C19	103209-G2	23207	Cap, 0.22 uf, 20%, 50V
C7,C8	104026-G5	23207	Cap, 20 pf, 5%, 500V
C9,C9A,C10-C12,C30	104021-G1	23207	Cap, 1000 pf, 5%, 100V
C13	104020-G2	23207	Cap, 560 pf, 5%, 300V
C14	104110-G5	23207	Cap, .01 uf, 2%, 50V
C15,C20-C29	103209-G3	23207	Cap, 0.47 uf, 20%, 50V
C16	104025-G4	23207	Cap, 3300 pf, 5%, 500V
C17	104110-G1	23207	Cap, .022 uf, 2%, 50V
C18	104010-G7	23207	Cap, 100 pf, 2%, 100V
CR4,CR6	104412-G2	23207	Diode, High Speed Switching
CR5	103295	23207	Diode, Zener (1N825A)
J10	3-87227-0	00779	Connector, Header
Q1	103286	23207	Transistor
R1	RCR07G106J	81349	Res, 10 Meg, 5%, 1/4W
R2-R5	RCR07G392J	81349	Res, 3.9K, 5%, 1/4W
R6,R7	RCR07G153J	81349	Res, 15K, 5%, 1/4W

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

REPLACEABLE PARTS LIST

626-PA-6003

DIGITAL BOARD A2 (P/N 110236) (CONT'D)

REFERENCE DESIGNATION	PART NO.	MAN. CODE NO.	DESCRIPTION
R8,R10, R29	RN55C1000F	81349	Res, 100 ohms, 1%, 1/10W
R9	RN55C2002F	81349	Res, 20K, 1%, 1/10W
R11,R19, R26	RN55C1003F	81349	Res, 100K, 1%, 1/10W
R12	104700-G5	23207	Res, Var, 100K, 10%, 1/2W
R13,R18	RN55C1002F	81349	Res, 10K, 1%, 1/10W
R14	104700-G5	23207	Res, Var, 100K, 10%, 1/2W
R15	104701-G8	23207	Res, Var, 5K, 10%, 1/2W
R16	RN55C5493F	81349	Res, 549K, 1%, 1/10W
R17	RN55C4990F	81349	Res, 499 ohms, 1%, 1/10W
R20,R28	RCR07G512J	81349	Res, 5.1K, 5%, 1/4W
R21	RN55C2743F	81349	Res, 27.4K, 1%, 1/10W
R22,R23	RN55C1001F	81349	Res, 1K, 1%, 1/10W
U1	104263-G3	23207	IC, 8-Bit Bi-Direct Trans.
U2	104225-G5	23207	IC, Octal Buffer, 3-State
U2A,U25	104225-G6	23207	IC, Octal D-Latch, 3-State
U3	104239-G1	23207	IC, CMOS CPU
U4,U5,U15, U33	104214-G1	23207	IC, Quad 2-Input Positive NAND Gate

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

REPLACEABLE PARTS LIST

626-PA-6003

DIGITAL BOARD A2 (P/N 110236)

REFERENCE DESIGNATION	PART NO.	MAN. CODE NO.	DESCRIPTION
U6	104221-G7	23207	IC, Dual 1 to 4 Decoder
U7	104218-G8	23207	Quad Buffer, 3 State
U8	See Program Listing 105909	23207	IC, EPROM
U9,U28A-U28C	104218-G9	23207	IC, Quad S-R Latch
U10	104226-G2	23207	IC, Dual Up Counter
U11,U30A-U30C, U32A-U32C	104225-G7	23207	IC, Octal Latch, 3 State
U12	104221-G1	23207	IC, Decode Demux
U13	104220-G7	23207	IC, Quad "D" Flip-Flop
U14	See Program Listing 105909	23207	IC, EPROM
U16	104206-G4	23207	IC, Dual Monostable Multivibrator
U17	104238-G1	23207	IC, Hex D Latch
U18	104231-G5	23207	IC, Dual Multivibrator
U19	104216-G6	23207	IC, Dual Multivibrator
U20	104237-G1	23207	IC, 12-Bit A/D Converter
U21,U27	104247-G1	23207	IC, Dual Op-Amp, Low Power

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987 Dranetz Technologies, Inc. All Rights Reserved.

REPLACEABLE PARTS LIST

626-PA-6003

DIGITAL BOARD A2 (P/N 110236)

REFERENCE DESIGNATION	PART NO.	MAN. CODE NO.	DESCRIPTION
U22	104200-G3	23207	IC, Quad 2-Input NAND Gate
U23	104255-G1	23207	IC, Analog Switch
U24	104231-G4	23207	IC, Quad D Latch, 3 State
U26	104206-G2	23207	IC, 14-Stage Binary Counter
U29A-U29C, U31A-U31C	104217-G2	23207	IC, Dual Binary Counter
XU3	104935	23207	IC Socket, 40 Pin
XU8,XU14	104933	23207	IC Socket, 24 Pin
XU20	104934	23207	IC Socket, 28 Pin
Y1	107488	23207	Crystal, 4.096 MHz

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

SECTION VII

SCHEMATIC DIAGRAMS AND ASSEMBLY DRAWINGS

This section contains the schematic diagrams and assembly drawings for the 6003 plug-in. The schematic diagrams (figs. 7-3 and 7-4) supplement the Theory of Operation section; the assembly drawings (figs. 7-1 and 7-2) illustrate and locate the parts referenced in the Maintenance and Replaceable Parts List sections of this manual.

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.

DRANETZ
S3
S2
U16
C36
C35
R51
Y2
C49
R59
C28
R53
R45
Y1
R52
R49
C27
R50
C48
R44
R80
R56
R55
R55
U17
R47
C59
C50
Q1
C32
R46
J10
R79
R60
CR10
R61
R57
R58
R43
R54
C30
U15
C31
C47
C33
C37
C34
C38

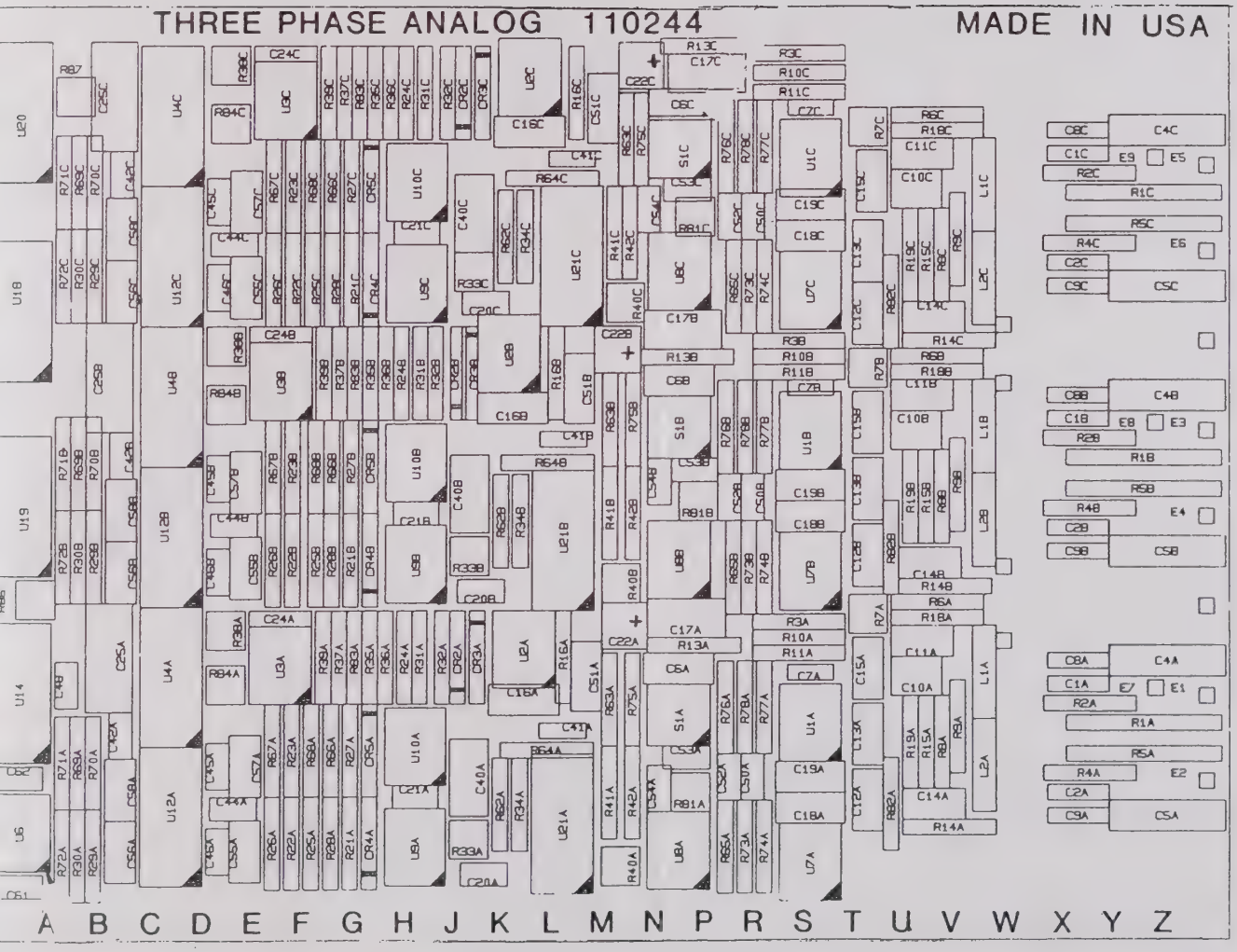
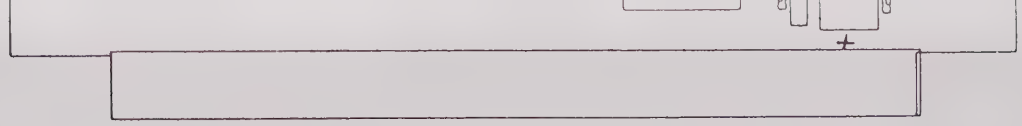


Figure 7-1. 6003 Analog Board, Assembly Drawing
110244, Rev. H

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.



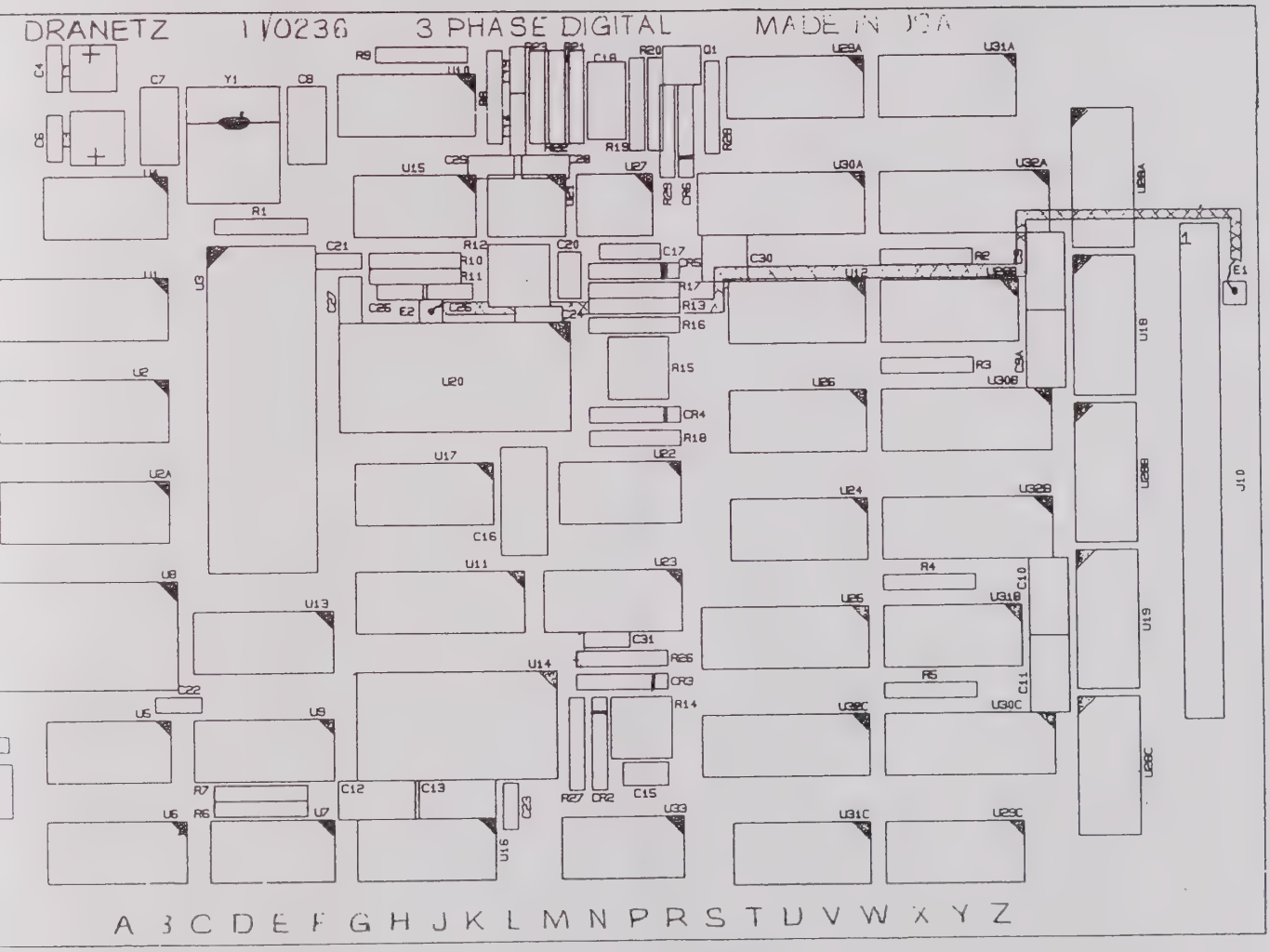
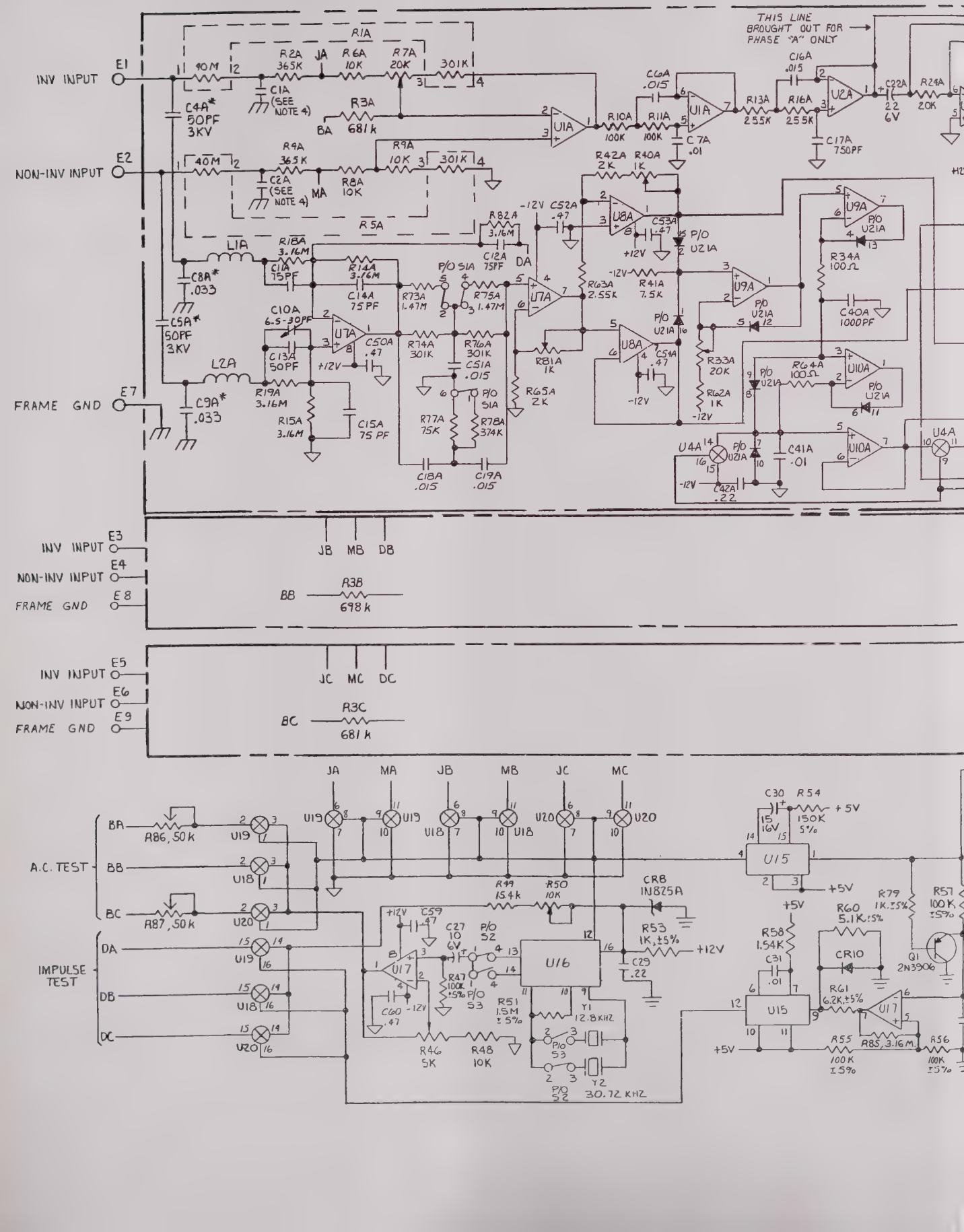
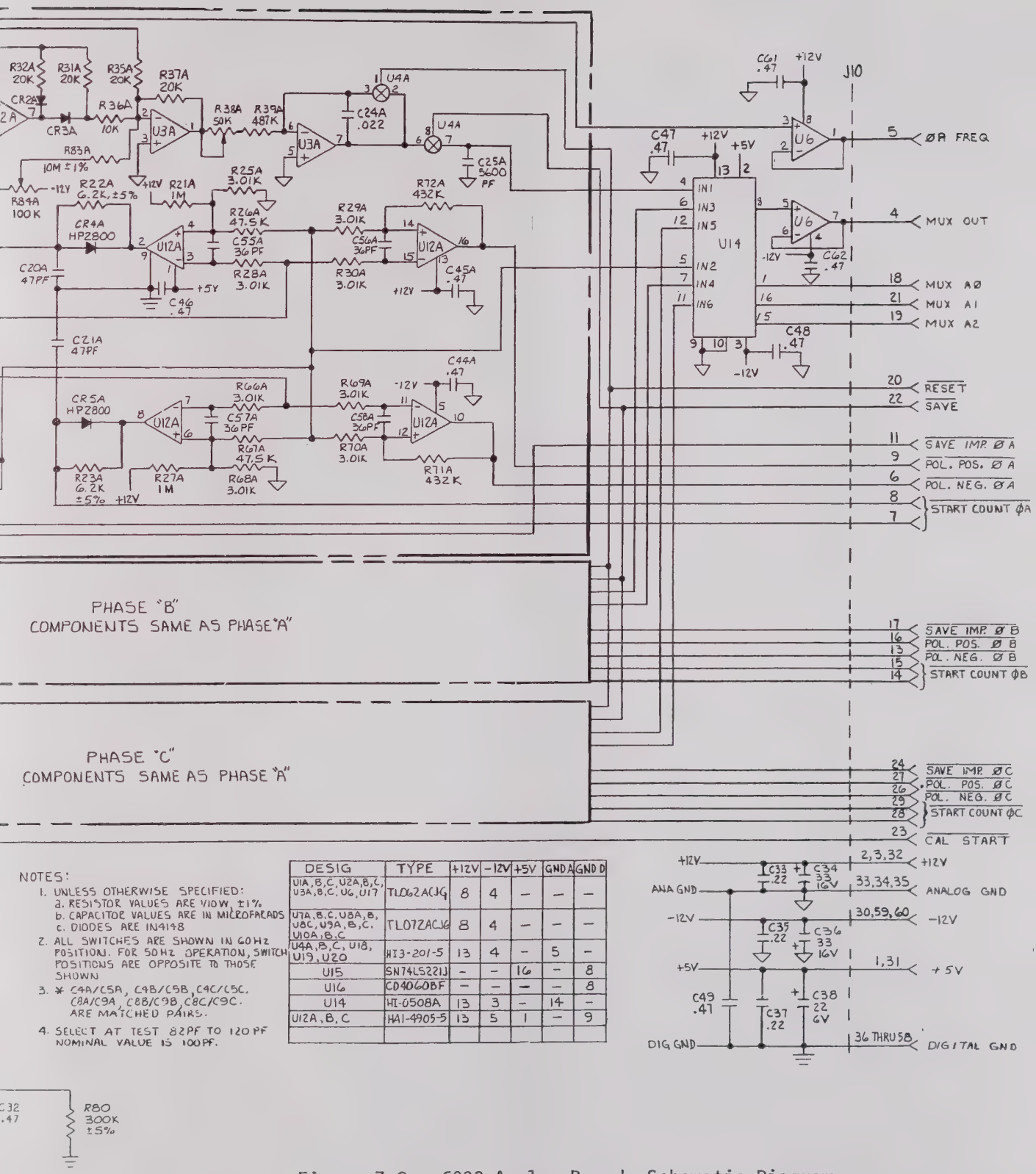


Figure 7-2. 6003 Digital Board, Assy Drawing 110236, Rev. G

Proprietary Information -- Copyright © 1981, 1982, 1983, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.


INV INPUT
NON-INV INPUT
FRAME GND
E1
E2
E7
E3
E4
E8
E5
E6
E9
R1A
R2A 365K
R6A 10K
R7A 20K
301K
40M
C1A (SEE NOTE 4)
C4A* 50PF 3KV
R3A 681 k
BA
JA
MA
R9A 365 K
R8A 10K
C2A (SEE NOTE 4)
R5A
L1A
L2A
C8A* .033
C5A* 50PF 3KV
C9A* .033
R18A 3.16M
C11A 15PF
R19A 3.16M
R15A 3.16M
C15A 75 PF
C10A 6.5-30PF
C13A 50PF
R14A 3.16M
C14A 75 PF
R73A 1.47M
R74A 301K
R76A 301K
C51A .015
R77A 75K
R78A 374K
C18A .015
C19A .015
R75A 1.47M
R65A 2K
R81A 1K
R82A 3.16M
C12A 75PF
DA
-12V
C52A .47
C53A .47
+12V
C50A .47
C54A .47
U1A
U2A
U7A
U8A
U9A
U10A
U4A
C6A .015
C7A .01
R10A 100K
R11A 100K
R13A 255K
R16A 255K
C16A .015
C17A 750PF
C22A 22 6V
R24A 20K
R42A 2K
R40A 1K
R63A 2.55K
R41A 7.5K
R62A 1K
R33A 20K
R34A 100Ω
C40A 1000PF
R64A 100Ω
C41A .01
C42A .22
P/O U21A
P/O 51A
THIS LINE BROUGHT OUT FOR PHASE "A" ONLY
JB MB DB
BB
R3B 698 k
JC MC DC
BC
R3C 681 k
JA MA JB MB JC MC
A.C. TEST
IMPULSE TEST
BA BB BC
DA DB DC
R86, 50 k
R87, 50 k
U19 U18 U20
R49 15.4 k
R50 10K
CR8 IN825A
R53 1K, ±5%
+12V
C29 .22
U16
U17
C27 10 6V
P/O 52
R47 100K ±5%
P/O 53
R51 1.5M ±5%
Y1 12.8 KHZ
Y2 30.72 KHZ
R46 5K
R48 10K
C60 .47
C59 .47
C30 15 16V
R54 150K 5%
+5V
U15
R58 1.54K
C31 .01
R60 5.1K ±5%
CR10
R79 1K ±5%
R57 100K ±5%
Q1 2N3906
R61 6.2K ±5%
R55 100K ±5%
R85, 3.16M
R56 100K ±5%



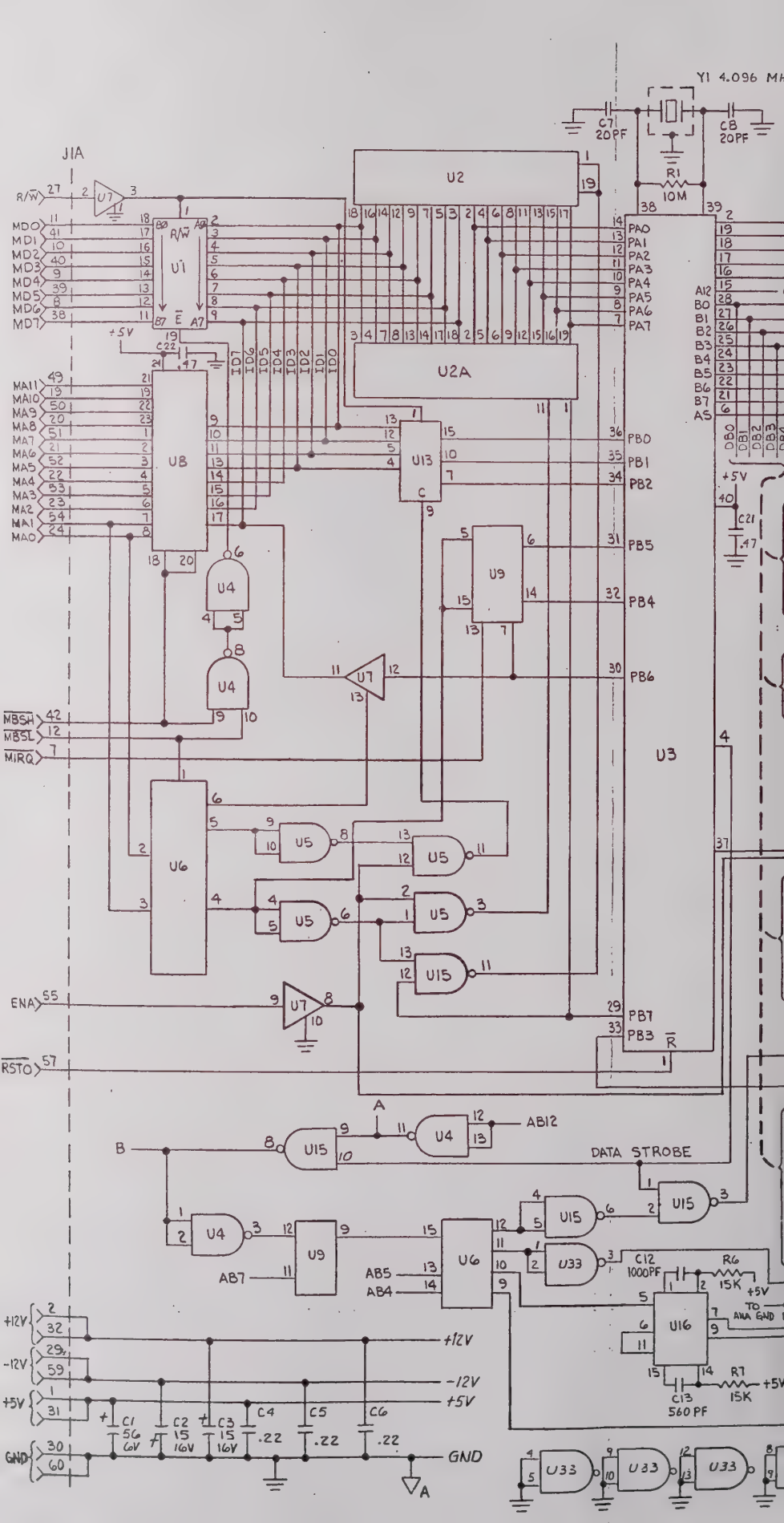
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a. RESISTOR VALUES ARE 1/10W, ±1%
   b. CAPACITOR VALUES ARE IN MICROFARADS
   c. DIODES ARE IN4148
2. ALL SWITCHES ARE SHOWN IN 60Hz POSITION. FOR 50Hz OPERATION, SWITCH POSITIONS ARE OPPOSITE TO THOSE SHOWN
3. * C4A/C5A, C4B/C5B, C4C/C5C. C8A/C9A, C8B/C9B, C8C/C9C. ARE MATCHED PAIRS.
4. SELECT AT TEST 82PF TO 120 PF NOMINAL VALUE IS 100PF.

DESIG	TYPE	+12V	-12V	+5V	GNDA	GND D
U1A,B,C, U2A,B,C, U3A,B,C, U6, U17	TL062ACJG	8	4	–	–	–
U7A,B,C, U8A,B, U8C, U9A,B,C, U10A,B,C	TL072ACJG	8	4	–	–	–
U4A,B,C, U18, U19, U20	HI3-201-5	13	4	–	5	–
U15	SN74LS221J	–	–	16	–	8
U16	CD4060BF	–	–	–	–	8
U14	HI-0508A	13	3	–	14	–
U12A,B,C	HA1-4905-5	13	5	1	–	9

Figure 7-3. 6003 Analog Board, Schematic Diagram
(Assy 110244, Schematic 110249, Rev. H)

Proprietary Information -- Copyright © 1981, 1983, 1984, 1985, 1987
Dranetz Technologies, Inc. All Rights Reserved.


JIA
Y1 4.096 MH
C7 20PF
C8 20PF
R1 10M
U2
U2A
U1
U3
U6
U7
U8
U9
U13
U15
U16
U33
U4
U5
R/W
MD0
MD1
MD2
MD3
MD4
MD5
MD6
MD7
MA11
MA10
MA9
MA8
MA7
MA6
MA5
MA4
MA3
MA2
MA1
MA0
MBSH
MBSL
MIRQ
ENA
RSTO
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PB0
PB1
PB2
PB5
PB4
PB6
PB7
PB3
+5V
C22 .47
C21 .47
ID7
ID6
ID5
ID4
ID3
ID2
ID1
ID0
A
B
ABI2
DATA STROBE
AB7
AB5
AB4
C12 1000PF
R6 15K
R7 15K
C13 560 PF
TO ANA GND
+12V
-12V
GND
C1 56 6V
C2 15 16V
C3 15 16V
C4 .22
C5 .22
C6 .22

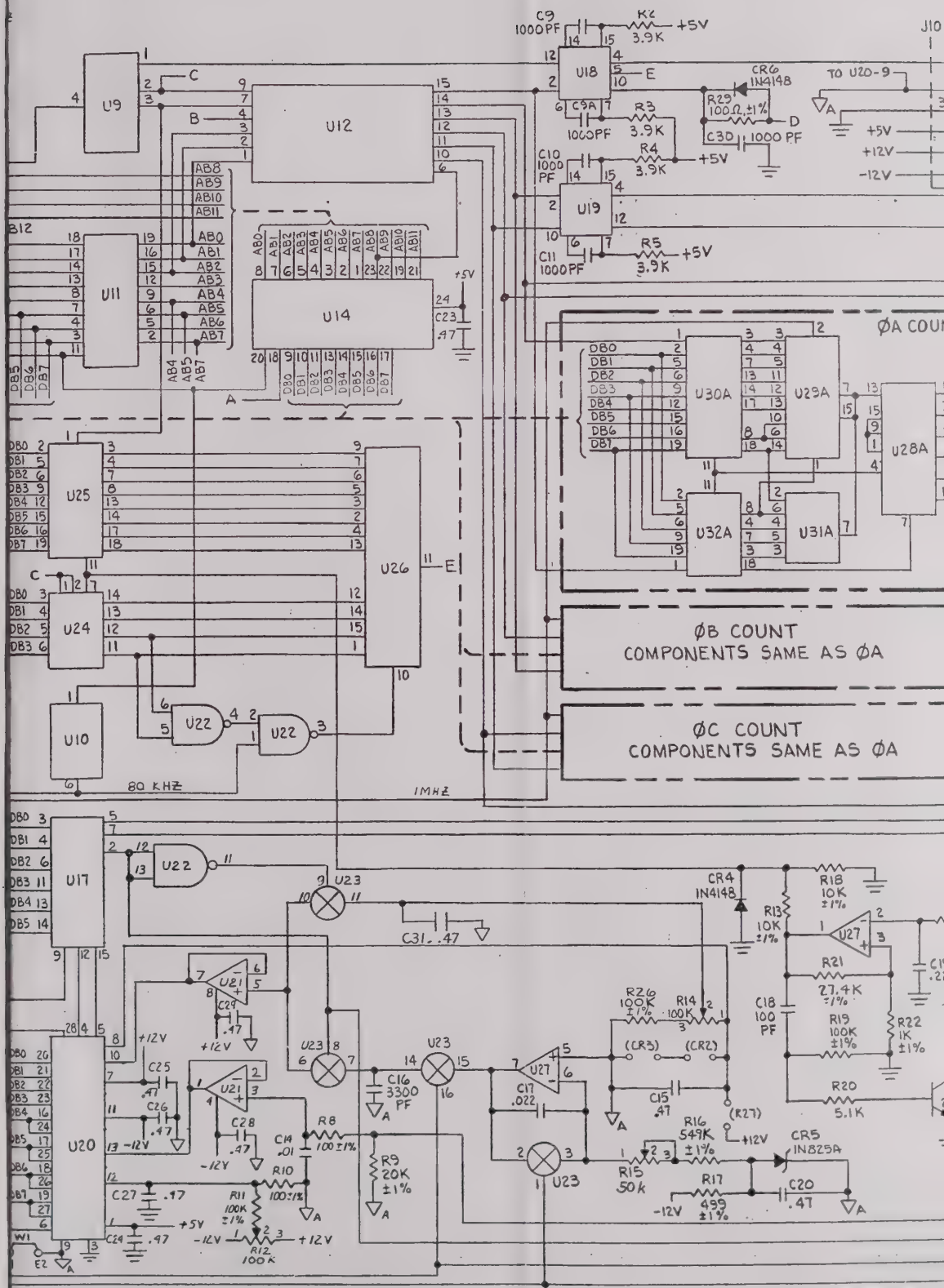
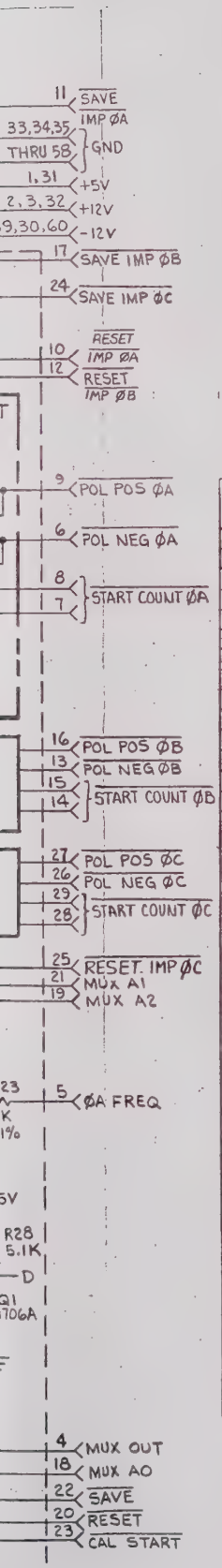


Figure 7-4. 6003 Dig
(Assy 11

Proprietary Information - Co
Dranetz Technologi



DESIG	TYPE	+12V	-12V	+5V	⏚ GND	▽ GND
U1	SN74LS245N			20	10	
U2	MM74C244J			20	10	
U2A	MM74C374J			20	10	
U3	MM146805E2			40	20	
U4	SN74LS00J			14	7	
U5				14	7	
U6	SN74LS139J			16	8	
U7	SN74LS125J			14	7,10	
U8	27C32			24	12	
U9	SN74LS279J			16	8,10	
U10	CD4518			2,9,16	7,8	
U11	MM74C373J			20	1,10	
U12	SN74LS138J			16	5,8	
U13	SN74LS379			16	8	
U14	27C32			24	12	
U15	SN74LS00J			14	7	
U16	CD4098BF			3,13,14	4,8,12	
U17	MC14174			1,16	8	
U18	MM74C221J			3,11,16	1,8,9	
U19	SN74LS221J			3,11,16	1,8,9	
U20	AD574AKD	7	11	1	2,15,3	9
U21	TL072ACP	8	4			
U22	CD4011UBF			14	7	
U23	HI3-201-5	13	4		5	
U24	MM74C173J			16	8,9,10,15	
U25	MM74C374J			20	10	
U26	CD4040BF			16	8	
U27	TL072ACP	8	4			5
U28A	SN74LS279J			16	8,10,14	
U28B				16	8,10,14	
U28C				16	8,10,14	
U29A	MC14520BCL			16	8,9	
U29B				16	8,9	
U29C				16	8,9	
U30A	MM74C373J			20	10	
U30B				20	10	
U30C				20	10	
U31A	MC14520BCL			15,16	1,8,9,10	
U31B				15,16	1,8,9,10	
U31C				15,16	1,8,9,10	
U32A	MM74C373J			20	10,13,14,17	
U32B				20	10,13,14,17	
U32C				20	10,13,14,17	
U33	SN74LS00			14	7	

tal Board, Schematic Diagram
0236, Schematic 110241, Rev. G)

yright © 1981, 1983, 1984, 1985, 1987
s, Inc. All Rights Reserved.

MP MASTER
MA23081